IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with <u>underlining</u> and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered). Please CANCEL claims 1-10 and ADD new claims 11-23 in accordance with the following:

1-10. (canceled)

11. (new) A bidirectional signal processing method for the parallel transmission of digital transmit data streams, in regular and singular radio channels, of a multiple input-multiple output radio transmission system (MIMO system), having n_T transmit antennas and n_R receive antennas, that rank-adaptive matches the data transmission rate to the total currently available channel capacity while keeping constant the maximum transmit power P_{tot} as the sum of all subchannel powers P_i, where $i = 1...min (n_T, n_R)$, and that rank-adaptive matches the data transmission rate, in respect of a channel matrix $\mathbf{H}$, to the currently available channel capacity by varying and continuously adjusting the current channel behavior of n_d currently used subchannels and the spectral efficiency K of at least one selected coding and modulation method, comprising:

determining the channel matrix $\mathbf{H}$ on the transmit and the receive side of the MIMO system according to $\mathbf{y} = \mathbf{Hx} + \mathbf{n}$, where $\mathbf{y}$ = receive vector, $\mathbf{x}$ = transmit vector, and $\mathbf{n}$ = noise vector;

using a singular value decomposition $SVD(\mathbf{H}) = \mathbf{UDV}^H$ of the known channel matrix $\mathbf{H}$ with a maximum rank $(n_T \times n_R)$ on the transmit side and the receive side of the MIMO system to determine unitary transformation matrices $\mathbf{U}$ and $\mathbf{V}$ and a diagonal matrix $\mathbf{D}$ containing the ordered singular values $\sqrt{\lambda_i}$ derived from the eigenvalues λ_i of the subchannels on the left main diagonal;

modifying the transmit data vector **x** on the transmit side of the MIMO system by means

of a linear matrix-vector multiplication according to $\mathbf{x} = \dfrac{1}{\gamma}\mathbf{V\,Q\,d}$, where $\gamma = \sqrt{\displaystyle\sum_{i=1}^{n_d}\frac{P_1}{P_{tot}}} =$

amplification factor for limiting the total transmit power P_{tot}, where **Q** = diagonal transmit matrix containing the values $\sqrt{P_i}$ on the left main diagonal, and where **d** = current transmit data vector containing the variable length $n_d \le \min(n_T, n_R)$ for the support of n_d subchannels for the parallel transmission of the transmit data streams;

multiplying the currently received transmit data vector **d'** on the receive side of the MIMO system by $\gamma\mathbf{U}^H$, from which it follows $\mathbf{d^*} = \gamma\mathbf{U}^H\mathbf{y} = \mathbf{D\cdot Q\cdot d} + \gamma\mathbf{U}^H\mathbf{n}$;

determining the n_d components d_k^* of the currently received and modified transmit data

vector **d*** according to $d^*_k = \sqrt{\lambda_k \cdot P_k \cdot d_k} + \gamma\cdot\tilde{n}_k$, where $k = 1 \ldots n_d$;

selecting the subchannel powers P_i with either:

a) optimal rank-adaptive support for all subchannels $P_i > 0$ based on the water-

filling principle WF according to $P_i = \left(\mu - \dfrac{\sigma_n^2}{\lambda_i}\right)^+$, where $(a)^+ = 0$ for $a = 0$ and $(a)^+ = a$ for $a \ne 0$,

where μ = fill factor, which is chosen so that $\displaystyle\sum_{i=1}^{n_d} P_i = P_{tot} \Rightarrow \gamma = 1$, and where σ_n^2 = noise power

at the receiver, which yields the number n_d of the currently usable subchannels for a modification

of the current transmit data vector **d** according to $n_d = \big|\{i : P_i > o\}\big|$ and which yields a variable

signal-to-noise ratio according to $SNR_k^{WF} = \dfrac{\lambda_i \cdot P_i}{\sigma_n^2}$, or

b) suboptimal rank-adaptive support for all subchannels based on the adaptive channel inversion principle ACI according to **DQ = I**, where **I** = unity matrix for a complete

interference cancellation according to $P_i = \dfrac{1}{\lambda_i}$, where the number n_d of the currently usable

subchannels is selected for a modification of the current transmit data vector **d** such that the spectral efficiency K of the transmission is maximized and a constant signal-to-noise ratio is

produced according to $SNR_k^{ACI} = \dfrac{P_{tot}}{\sigma^2 \displaystyle\sum_{i=1}^{n_d}\frac{1}{\lambda_1}}$; and

selecting an optimal coding and modulation method based on a determined signal-to-noise ratio SNR_k^{WF} or SNR_k^{ACI} with a specific bit error rate, BER, to be complied with, where in case a) of the optimal rank-adaptive channel support, the optimal coding and modulation method is selected in each case for each of the n_d active subchannels or in case b) of the suboptimal rank-adaptive channel support, a common coding and modulation method is selected for all n_d active subchannels.

12. (new) The bidirectional signal processing method of claim 11, further comprising selecting the optimal coding and modulation method by comparing the determined values SNR_k^{WF} for the currently activated subchannels with SNR values required for a specific coding and modulation method enabling the specified bit error rate, BER, to be complied with using the currently available subchannel powers P_i.

13. (new) The bidirectional signal processing method of claim 11, further comprising selecting the optimal coding and modulation method by comparing the determined value SNR_k^{ACI} for all currently activated subchannels with an SNR value required for a specific coding and modulation method enabling the specified bit error rate, BER, to be complied with using the maximum transmit power P_{tot}, including a power increase through the support for the currently activated subchannels on the basis of the current transmitter-side singular value decomposition.

14. (new) The bidirectional signal processing method of claim 11, further comprising transmitting the current number, n_d, of activated subchannels, as determined on the transmit side, to the receive side via a signaling channel.

15. (new) The bidirectional signal processing method of claim 11, further comprising front-end compensating, on the transmit side, of statistical fluctuations in the maximum transmit power of the MIMO system.

16. (new) The bidirectional signal processing method of claim 11, further comprising selecting a transmit covariance matrix $\mathbf{Q} = \mathbf{D}^{-1}$ for matching all currently active subchannels to an identical performance, where $\gamma = \sqrt{\sum_{i=1}^{n_d} \frac{1}{\lambda_1}}$.

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17. (new) The bidirectional signal processing method of claim 11, further comprising a MIMO system which operates according to the Time Division Duplex transmission method.

18. (new) The bidirectional signal processing method of claim 11, further comprising a MIMO system in which the channel estimation in the uplink is reused for the signal processing in the downlink and vice versa.

19. (new) The bidirectional signal processing method of claim 11, further comprising a source commonly coded and modulated on the transmitter side for all the data streams to be transmitted in parallel.

20. (new) The bidirectional signal processing method of claim 11, further comprising decomposing the transmit and receive signal by an OFDM method into a plurality of subcarrier signals, with the bidirectional signal processing method being performed for each subcarrier signal.

21. (new) The bidirectional signal processing method of claim 13, further comprising transmitting the current number, n_d, of activated subchannels, as determined on the transmit side, to the receive side via a signaling channel.

22. (new) The bidirectional signal processing method of claim 21, further comprising front-end compensating, on the transmit side, of statistical fluctuations in the maximum transmit power of the MIMO system.

23. (new) The bidirectional signal processing method of claim 22, further comprising selecting a transmit covariance matrix $Q = D^{-1}$ for matching all currently active subchannels to an identical performance, where $\gamma = \sqrt{\sum_{i=1}^{n_d} \frac{1}{\lambda_1}}$.

24. (new) The bidirectional signal processing method of claim 23, further comprising a MIMO system which operates according to the Time Division Duplex transmission method.

25. (new) The bidirectional signal processing methodof claim 24, further comprising a MIMO system in which the channel estimation in the uplink is reused for the signal processing in the downlink and vice versa.

26. (new) The bidirectional signal processing method of claim 25, further comprising a source commonly coded and modulated on the transmitter side for all the data streams to be transmitted in parallel.

27. (new) The bidirectional signal processing method of claim 26, further comprising decomposing the transmit and receive signal by an OFDM method into a plurality of subcarrier signals, with the bidirectional signal processing method being performed for each subcarrier signal.